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REPORT

of

The Infantry Board

No. 1361

COMPARATIVE TEST OF THE PROJECTOR, SIGNAL, GROUND M4 AND PISTOL, PYROTECHNIC M2, CAL. 1.56

FORT BENNING, GEORGIA

June 18, 1942.

Authority NND735022

IB-471.6

June 18, 1942

SUBJECT: Comparative Test of The Projector, Signal, Ground, M4 and Pistol, Pyrotechnic, M2, Cal. 1.56.

TO: Chief of Requirements Division,
Army Ground Forces,
Army War College, Washington, D. C.

1. The Infantry Board concurs with the conclusions of the Test Section's Report of Test.

2. During the course of the Air-Ground Mutual Identification and Recognition Tests (Infantry Board Report No. 1363) the signals fired from the Very pistol, MIII (10-gauge) and the Very pistol, M5, were found to be unsatisfactory. During these same tests it was found that the Army and Navy type signals fired from the M2 pyrotechnic pistol, Cal. 1.56, were satisfactory. The question was then raised as to whether or not the projector, ground signal, M4, could be used for projecting the Army and Navy type signal in order to have but one type of signal projector in the Infantry. This comparative test was initiated to determine this. During the course of this comparative test it was found that the projector, ground, signal, M4, could be used to fire Army and Navy type signals. The Test Section's projector (Plate IV b) was then developed and found superior to either the projector, ground signal, M4, or the pistol, pyrotechnic, M2, Cal. 1.56, for firing Army and Navy type signals; however, the Test Section's projector will not fire the ground signals. After this the idea of using the M1 launcher (rifle antitank grenade launcher) for projecting signals was conceived and tried out with a considerable degree of success. This later idea has great merit in that it uses an item of equipment now standardized (M1 launcher) and would eliminate the projector, ground signal, M4, as well as the Very pistol, MIII (10-gauge) and the Very pistol, M5.

3. It is the opinion of the Infantry Board that:

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a. It is highly desirable that, (1) the Infantry be equipped with one type of projector for pyrotechnic signals, (2) the signals used by various echelons of the Infantry be capable of being projected from any signal projector in the Infantry. Signals that could be projected from the M1 launcher (rifle antitank grenade launcher) would fulfill this desirability.

b. The projector developed by the Test Section (Plate IV b) is superior to either the projector, ground signal, M4, or the M2 pyrotechnic pistol for firing Army and Navy type signals. The Test Section's projector and the M2 pyrotechnic pistol will not project the ground signals. Both the Army and Navy signals and the ground signals can be fired from the projector, ground signal, M4. Therefore, the projector, ground signal, M4, is superior to the Test Section's projector and the M2 pyrotechnic pistol for general Infantry use.

4. The Infantry Board recommends that:

a. Two types of signals be developed which can be projected from the launcher, M1 (rifle antitank grenade launcher) one with characteristics of the Army and Navy type signal, the other with characteristics of the ground signals for the projector, ground signal, M4. (See Appendix D of Report of Test). These to replace all other signals now issued to the Infantry. The launcher, M1, to replace the Very pistol, MIII (10-gauge), Very pistol, M5, and the projector, ground signal, M4.

b. Pending the development and standardization of the signals in a, above, the projector, signal, ground, M4, be issued to the Infantry as substitute standard in lieu of the pistol, Very, signal, MIII (10-gauge) and the Very pistol, M5.

c. Pending the development and standardization of the signals in a, above, Army and Navy type signals be issued as substitute standard in lieu of the signals for the pistol, Very, MIII (10-gauge) and the pistol, M5.

For the President:

M. J. GUNNER,
Colonel, Infantry,
Director.

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REPORT of TEST

COMPARATIVE TEST OF THE PROJECTOR, SIGNAL, GROUND M4 AND PISTOL, PYROTECHNIC M2, CALIBER 1.56

TEST SECTION
THE INFANTRY BOARD
FORT BENNING, GEORGIA

Submitted to
THE INFANTRY BOARD

Copy No. 6 **Date** June 11, 1942.

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TEST SECTION
THE INFANTRY BOARD
FORT BENNING, GEORGIA

June 11, 1942

SUBJECT: COMPARATIVE TEST OF THE PROJECTOR, SIGNAL, GROUND, M4 AND PISTOL, PYROTECHNIC, M2, CALIBER 1.56

TO: THE PRESIDENT, THE INFANTRY BOARD, FORT BENNING, GEORGIA

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I AUTHORITY AND REFERENCES

1. Authority - Letter, The Infantry Board, May 16, 1942 (IB 471.6) See Appendix "A".

2. References - Infantry Board Reports of Test:

a. No. 224 - June 27, 1922 - Pyrotechnic Dischargers and Signals.

b. No. 440 - June 12, 1928 - Pyrotechnic Projector.

c. No. 610 - May 27, 1932 - Signals, Ground.

d. No. 646 - March 9, 1933 - Signals, Ground.

e. No. 1052 - April 6, 1939 - Pyrotechnic Projector, T1E2.

f. No. 1087 - September 30, 1939 - Pyrotechnic Signals.

g. No. 1227 - June 24, 1941 - Illuminating flares.

h. No. 1270 - October 10, 1941 - Pyrotechnic Projector M4 (Modified).

i. No. 1353 - May 24, 1942 - Air-Ground Mutual Recognition and Identification.

II PURPOSE OF TEST

3. a. To determine, generally, whether the Projector, Signal, Ground, M4 or the Pistol, Pyrotechnic, M2, Cal. 1.56, should replace the Very Pistol, Signal MIII.

b. To determine specifically:

(1) Comparative weight and bulk of the equipment and signals.

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(2) Ease of carrying equipment and signals.

(3) Time of burning.

(4) Height of trajectory.

(5) Ease of recognition of signals from ground to ground and ground to air.

III PERSONNEL.

4. Captain W. M. Myers and First Lieutenant Lawrence Nitzen, Test Section, The Infantry Board, conducted the tests and prepared this report.

IV INTRODUCTORY INFORMATION AND DESCRIPTION OF THE PROJECTS TESTED

5. a. The Very Pistol, Signal, MIII, was found unsatisfactory for ground to air signaling. See Infantry Board Report of Test No. 1353, May 24, 1942, Air-Ground Mutual Recognition and Identification.

b. On May 16th, the Test Section was directed to conduct comparative tests to determine whether the Projector, Signal, Ground, M4, or the Pistol, Pyrotechnic, M2, Cal. 1.56, should replace the Very Pistol, Signal MIII. See Plate I.

6. a. The Projector, Signal, Ground, M4, consists of a steel tube or barrel about one foot long and of 42-mm gauge. A firing pin is fixed in the center of the base and the signal is fired by sharply striking the base upon the ground. See Plate II.

b. The Pistol, Pyrotechnic, M2, consists of a heavy frame or receiver, the cartridge serving as the barrel from which the signal is fired. See Plate III.

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V DETAILS OF TESTS AND RESULTS

7. Test No. 1

a. Purpose: To record the comparative weights and measurements of the subject signaling devices.

b. Method: Weights and measurements were taken and recorded.

c. Results:

(1) Weights:

(a) Projector, Signal, Ground, M4.

	Weight
Barrel	2.31 lbs.
Base cap	.33 lbs.
Spring and firing pin	.16 lbs.
Strap	.32 lbs.
Total	3.12 lbs.

		In Container	Signal Only
Signal, Ground	M17	.90 lbs.	.66 lbs.
" "	M18	.90 lbs.	.69 lbs.
" "	M19	.87 lbs.	.64 lbs.
" "	M20	.97 lbs.	.75 lbs.
" "	M21	.87 lbs.	.64 lbs.
" "	M22	.90 lbs.	.66 lbs.

(b) Pistol, Pyrotechnic, M2 - 3.23 lbs.

Signal	AN-M26	0.30 lbs.
	29	0.28 lbs.
	30	0.31 lbs.
	31	0.28 lbs.
	32	0.28 lbs.
	33	0.28 lbs.
	34	0.23 lbs.
	35	0.22 lbs.
	36	0.24 lbs.

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(2) Measurements:

(a) Projector, Signal, Ground, M4.

Overall length	-	12-1/8"
Barrel diameter	-	1-7/8"
Base cap diameter	-	2-1/4"
Carrying strap	-	1"x50" (25" maximum when used to carry projector).
Signal container	-	9-3/8" x 2" diameter.
Signal	-	cylinder 1.5" diameter x 5-11/16" long with 3-1/4" fin.

(b) Pistol, Pyrotechnic, M2.

Length of barrel	-	2-5/16" inside.
Overall length receiver and grip	-	8-1/2"
Signal	-	3" long x 1-5/16" diameter.

8. Test No. 2

a. Purpose: To determine comparative ease of carrying the subject signal devices and signals.

b. Method: By inspection and experimentation.

c. Results:

(1) The M4 projector was more easily carried than the M2 pistol.

(2) Based on an equal number of signals, the Army and Navy signal was more easily carried than the ground signal because of its smaller size.

9. Test No. 3

a. Purpose: To determine relative burning time of the subject signals.

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b. Method: Four signals of each available type were fired. The burning time was taken by stop watch and the results recorded.

c. Results:

(1) Signals, Army and Navy Aireraft:

	Burning time - Seconds					
Type	1	2	3	4	Average	Remarks
M29	6.0	6.1	6.0	7.8	6.96	
M30	7.5	6.8	7.2	7.0	7.1	
M31	8.0	5.2	8.2	7.5	7.2	
M35	8.2	8.1	7.5	8.1	7.98	
M36	7.8	6.5	7.6	7.2	7.3	

(2) Signal, Ground:

M19	28.0	27.5	25.4	27.5	27.1	Parachute.
M20	6.8	6.2	7.4	5.2	6.4	5-star cluster.
M21	26.0	27.0	22.5	25.8	25.3	Parachute.
M22	5.6	6.1	6.3	6.0	6.0	5-star cluster.

10. Test No. 4

a. Purpose: To determine whether or not the Army and Navy signals can be fired satisfactorily from the M4 projector.

b. Method: An attempt was made to fire Army and Navy type signals from the M4 projector and the results noted.

c. Results:

(1) It was found that the Army and Navy type signal could be fired from the M4 projector most satisfactorily by using the latter as a mortar, placing it at the desired angle and dropping the signal in. In instances when the signal failed to fire mortar fashion, striking the base against the ground generally discharged the signal.

(2) The following table is presented for statistical data contained therein:

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		Number	Percent
(a)	Total Army and Navy type signals fired	72	100
(b)	Number detonated mortar style	47	65.3
(c)	Number failing to detonate mortar style	25	34.7
(d)	Number of (c) above detonated by striking base of projector on ground	11	15.3
(e)	Number of (c) above requiring repeated blows to detonate	10	13.9
(f)	Number of duds	4	5.5

11. Test No. 5

a. Purpose: To determine height of trajectory of subject signals.

b. Method: Sufficient signals of each type were fired to enable a man equipped with a transit set on a known base line to determine the angle of maximum elevation. By computation the height of trajectory was determined and an average derived.

c. Results:

Type of Signal	Projector	Number of readings	Height of trajectory
AN-M28	Pistol, M2	2	55.2 yards
AN-M29	" "	4	65.1 yards
AN-M30	" "	3	59.9 yards
AN-M31	" "	9	61.6 yards
AN-M32	" "	6	68.3 yards
AN-M33	" "	10	66.1 yards
AN-M34	" "	5	72.3 yards
AN-M38	" "	8	77.6 yards
AN-M36	" "	5	79.5 yards
		Average	68.3 yards or 205 feet.

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Type of Signal	Projector	Number of readings	Height of trajectory
M17	M4	4	245 yards
M18	"	4	246 yards
M19	"	1	251 yards
M20	"	2	243 yards
M21	"	3	278 yards
M22	"	2	218 yards
		Average	247 yards or 741 feet.
AN-M29	M4	5	76.8 yards
AN-M30	"	4	79.5 yards
AN-M31	"	3	75.8 yards
AN-M35	"	2	87.2 yards
AN-M36	"	2	91.6 yards
		Average	80.9 yards or 243 feet.

It will be noted that the ground signals had approximately four times the altitude of the Army and Navy type signals, and that when the latter was fired from the M4 projector the altitude was increased by approximately 40 feet.

12. Test No. 6

a. Purpose: To record comparative data on ease of recognition of Army and Navy type and ground signals from ground to air extracted from Infantry Board Report of Test No. 1353, dated May 25, 1942, Subject: Air-Ground Mutual Recognition and Identification.

b. Method: Because the information required had been accurately ascertained and recorded in the above report, and in order to save time, the tests were not repeated. Pertinent facts taken from the above report are transcribed below.

c. Results:

(1) Details of tests relating to ground signals will be found on Pages 11-14, 16-17, 21, 33-35, and 48 of Report No. 1353.

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(2) Details of tests relating to the Army and Navy type signals will be found on Pages 15, 18-21, 33-35, 39, and 48 of Report No. 1353.

(3) Tests indicated that the white ground signals M17 and M18 and the red Army and Navy signals M28 and M34 were most satisfactory for ground to air use, and that the latter was necessary to supplement the former for recognition and identification of ground troops by aircraft.

13. Test No. 7

a. Purpose: To determine comparative ease of recognition of the Army and Navy type and ground signal from ground to ground under condition of daylight and at night.

b. Method:

(1) First Phase: Daylight operation. Four positions were selected involving masks of varying heights and densities, distances ranging from 1200 to 2300 yards, and permitting observation into the sun and at various angles from the line: sun - observer. The green parachute and cluster ground signals were compared with the single and double green Army and Navy type signals. The amber parachute and cluster ground signals were compared with the single and double yellow Army and Navy type signals. Opinion of observers were solicited through means of a questionnaire.

(2) Second Phase: Night operations: Four positions were selected involving masks of varying heights and densities and distances of from 500 to 2000 yards. All available signals of both types were fired from each of the four positions. The opinion of the observers were solicited by means of questionnaires.

(3) The questionnaires were studied and analyzed and the results summarized in Par. c, below.

c. Results:

(1) First Phase: Daylight operation.

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(a) Signals appeared to be of approximately equal intensity and when seen, to be equally well identified.

(b) The green signals were more easily recognized as such than were the amber and yellow signals. Of a total of eighteen amber and yellow signals an average of six of the former were identified as red and three of the latter were identified as white by competent observers at ranges under 1500 yards.

(c) It was the opinion of the observers that the Army and Navy type signal was more easily seen at shorter ranges than the ground signal, but that at the longer ranges the reverse was true.

(2) Second Phase: Night operations.

(a) It was the opinion of competent observers that all signals except the amber parachute ground (M21) signal were satisfactory from the standpoint of ease of recognition. The M21 signal appeared at times red, at other times yellow or white. Its color was not positive and hence recognition was handicapped.

(b) It was noted that the altitude of the Army and Navy type signal was insufficient to clear masks established as part of the test. It was the opinion of the observers that these signals, while possibly satisfactory for use by platoons, would not be satisfactory for use in the company because of its low trajectory.

(3) Summary: Comparable signals of each type were limited. Where such comparisons were possible, no difference could be discerned in the effectiveness of either from the standpoint of ease of recognition. All signals except the amber star parachute (M21) were considered satisfactory.

14. Test No. 8

a. Purpose: To record data derived during tests not formally covered by other tests.

b. Method: Notes were taken of pertinent facts not covered by other tests.

c. Results:

(1) The Army and Navy type signal, designed for

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use from aircraft, had a burning time greater than its flight time when fired from the ground from the M2 pistol. Three woods fires were started by these signals during the test period.

(2) The single star Army and Navy type signal had a higher trajectory than did the double star signal.

(3) When fired from the M4 projector, sufficient additional height was gained to permit the single star Army and Navy type signal to burn out before striking the ground.

15. Test No. 9

a. Purpose: To design a more satisfactory projector for the Army and Navy type signal.

b. Method: The first model was made of brass and weighed 1.88 pounds. (See Appendix "B", Figure 1). It had a number of weaknesses but appeared to have possibilities. Comments of interested members of the Infantry Board were obtained and a second model designed.

c. Results: The final model was made of steel and weighed 0.88 pounds. (See Appendix "B", Figure 2 and Plates IV b, V a, VI, VII and VIII.)

16. Test No. 10

a. Purpose: To determine whether the final model of Test Section projector as developed in paragraph 15, above, was entirely satisfactory and to compare it with the pyrotechnic pistol, M2.

b. Method: The Test Section projector was fired by holding it in one hand while striking the protruding end of the firing pin with the other hand. It was also fired by hitting on the ground the same way the M4 projector was fired. The height of projection of the Army and Navy type signal when fired in the Test Section projector was then compared with the height when fired in the pyrotechnic pistol, M2.

c. Results:

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(1) The Test Section pyrotechnic discharger could be easily fired by holding it in one hand while striking the flat protruding end of the firing pin with the other hand. It could be fired by striking the projector on the ground in a manner similar to firing of the projector, M4. Due to the recessed firing pin it would not fire as a mortar.

(2) Army and Navy signals traveled approximately seventeen and one-half feet higher when fired from the Test Section projector than when fired from the pyrotechnic pistol, M2. This was apparently due to the increased length of barrel (See Plate V). For actual data see Appendix "G".

(3) The M17 to M22 signals could not be fired in this projector.

17. Test No. 11

a. Purpose: To design a pyrotechnic signal capable of being projected from the grenade launcher.

b. Method: M11 grenade tail assemblies were placed on several M5, M6 and M7 pyrotechnic signals. (See Plate IX-c.) The primers and propellant charges had been removed from the signals prior to incorporating the tail assemblies. The regular special blank cartridge, caliber .30, M3, used as a propellant, started the powder train burning in the signal.

c. Results: Signals were ignited at an elevation of approximately 500 feet. It was noted that the signals were still gaining altitude when they ignited. A longer burning powder train would undoubtedly have resulted in ignition of the signals at greater altitudes than 500 feet.

VI DISCUSSION

18. Three combinations of the subject projectors and signals are possible for use in the platoon to replace the Very pistol. These are:

a. The M4 projector firing the ground signal.

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b. The M4 projector firing the Army and Navy type signal.

c. The M2 pistol firing the Army and Navy type signal.

19. A study of test results reveals the following advantages and disadvantages for each possibility.

a. The M4 projector firing the ground signal:

(1) Advantages:

(a) The projector is relatively light, easily carried and very efficient.

(b) The signals have a high trajectory and are easily recognized (with the exception of the M21).

(2) Disadvantages:

(a) The signals are larger, bulkier, and heavier than the Army and Navy type signals.

(b) The height of the trajectory is greatly in excess of that needed in the platoon.

(c) Use of the ground signal in the platoon would not provide the type signal found necessary in Report of Test No. 1353 for Air-Ground Mutual Recognition and Identification.

b. The M4 projector firing the Army and Navy type signal:

(1) Advantages:

(a) The M4 projector is light and easily carried.

(b) The M4 projector gives the Army and Navy signal a higher trajectory than does the M2 pistol.

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(c) The Army and Navy type signal is 1/3 the size and weight of the ground signal.

(d) Army and Navy type signals M34, M35 and M36 (single star) can be fired to sufficient altitudes to permit the signal to burn out before striking the ground.

(e) The ground signals can also be fired from the M4 projector should need for them arise.

(2) Disadvantages:

(a) Detonation of the Army and Navy type signal is not as positive when using the M4 projector as when using the M2 pistol.

(b) Any signal igniting immediately upon expulsion would betray the location of the firer to the enemy.

g. The M2 pyrotechnic pistol firing the Army and Navy type signal:

(1) Advantages:

(a) Detonation of the Army and Navy type signal is more positive than with the projector M4.

(2) Disadvantages:

(a) The M2 pistol is heavier and much more inconvenient to carry than the M4 projector.

(b) All Army and Navy type signals fired from the M2 pistol have insufficient trajectory height to permit the signals to burn out before striking the ground. They frequently started fire to the grass or woods.

(c) The Army and Navy type signal may disclose the position of the firer to the enemy.

20. From a study of the preceding paragraph it is evident that none of the possible combinations is ideal. The use of the Army and Navy type signal with the M4 projector appears to offer the greatest ratio of advantages to disadvantages.

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21. In order to overcome these disadvantages two development projects were attempted.

a. The first project resulted in a light weight (0.88 pounds) easily fired projector (See Plates IV to VIII) for use with the Army and Navy type signals. It was named the Test Section Projector. It is superior to either the pyrotechnic pistol M2 or the M4 projector in weight, size and ease of carrying. It is also superior as it can be fired the same as the M4 projector by pounding on the ground or if desired it can be fired by holding it in one hand while the flat protruding end of the firing pin was struck a light blow with the other hand. This projector is not designed to and will not fire the M17 to M22 pyrotechnic signals.

b. The second project resulted in producing a pyrotechnic signal capable of being fired from the grenade launcher M1 by using the special blank cartridge, caliber .30, M3. Several M5, M6 and M7 pyrotechnic signals were procured. The primers and propellant charges were removed and tail assemblies from M11 grenades were fastened to the base of the signals. The blank cartridge used as a propellant also started the powder train burning. The signals ignited at approximately 500 feet. It was noted that the signal was still gaining altitude when the signal ignited. (See Plates IX to XI inclusive.)

22. This new pyrotechnic signal appears to have considerable possibility when it is considered a great number of grenade launchers will soon be in the hands of troops especially front line units who are also most likely to use pyrotechnic signals. No attempt was made to vary the types of signals but it is believed that all types used with the M4 projector could be readily reproduced in this new signal. In order that the advantages of the Army and Navy type signal, especially for Air-Ground Identification, may be retained, double star signals without parachute should be designed. The maximum elevation of the double star signals should be just enough to allow the two stars to descend very close to the ground prior to burning out. Having the signal return to the ground while burning was found in previous tests to be very useful in directing the attention of the pilots to panels used to mark front lines. (For military characteristics of these pyrotechnic signals see Appendix "D".)

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VII CONCLUSIONS

23. The Test Section concludes:

a. That, the M4 projector is more suitable than the M2 pistol as a replacement for the Very pistol in the Infantry.

b. That, the M4 projector is bulkier, less clumsy and lighter than the M2 pistol.

c. That, the M4 projector is easier to carry than the M2 pistol.

d. That, Army and Navy type signals, when fired from the M4 projector, are superior to the same signals fired from the M2 pistol as to height of trajectory and visible burning time.

e. That, Army and Navy type signals are easier to carry than the Signals, Ground.

f. That, the projector designed by the Test Section (See Plates IV to VIII) is superior to either the M4 projector or the M2 pyrotechnic pistol for use with the Army and Navy type signals.

24. The Test Section further concludes that a development project should be initiated with the idea of producing pyrotechnic signals than can be discharged from the grenade launcher, M1. (See Military Characteristics in Appendix "D".)

H. O. SYDENHAM,
Lt. Col., Infantry,
Chief, Test Section.

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IB-471.6 May 16, 1942.

Subject: Comparative Test of the Projector, Signal, Ground M4 and Pistol, Pyrotechnic M2 Cal. 1.56.

To: Chief of Test Section,
The Infantry Board,
Fort Benning, Georgia.

1. The Very Pistol, Signal MIII has been found unsatisfactory for ground to air signaling.

2. It is requested that you conduct a comparative test of the Projector, Signal, Ground M4 and Pistol, Pyrotechnic M2 Cal. 1.56 to determine which one should replace the Very Pistol, Signal MIII. The Test should include:

a. Comparative weight and bulk of the equipment and signals.

b. Ease of carrying equipment and signals.

c. Time of burning.

d. Height of trajectory.

e. Ease of recognition of signals from ground to ground and ground to air.

3. The Report is desired not later than June 1, 1942.

4. Lt. Colonel W. A. Chazal is the Board member in charge of this project.

For the President:

W. A. CHAZAL,
Lt. Col., Infantry,
Acting Recorder.

APPENDIX "A"

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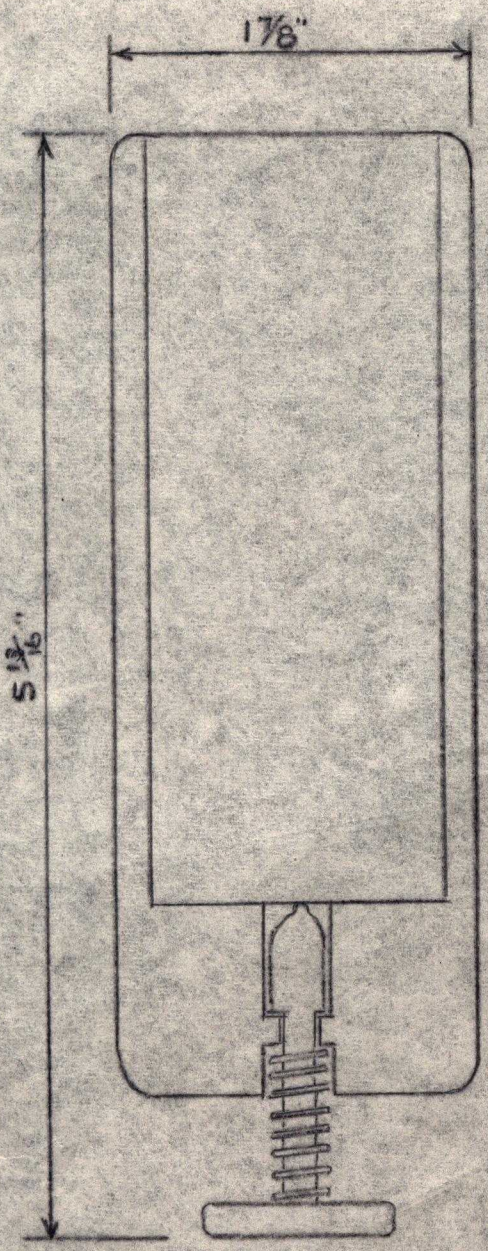

Figure 1
First Test model

Made of brass
Weight: 1.88 lbs.
Drawing: Full Scale

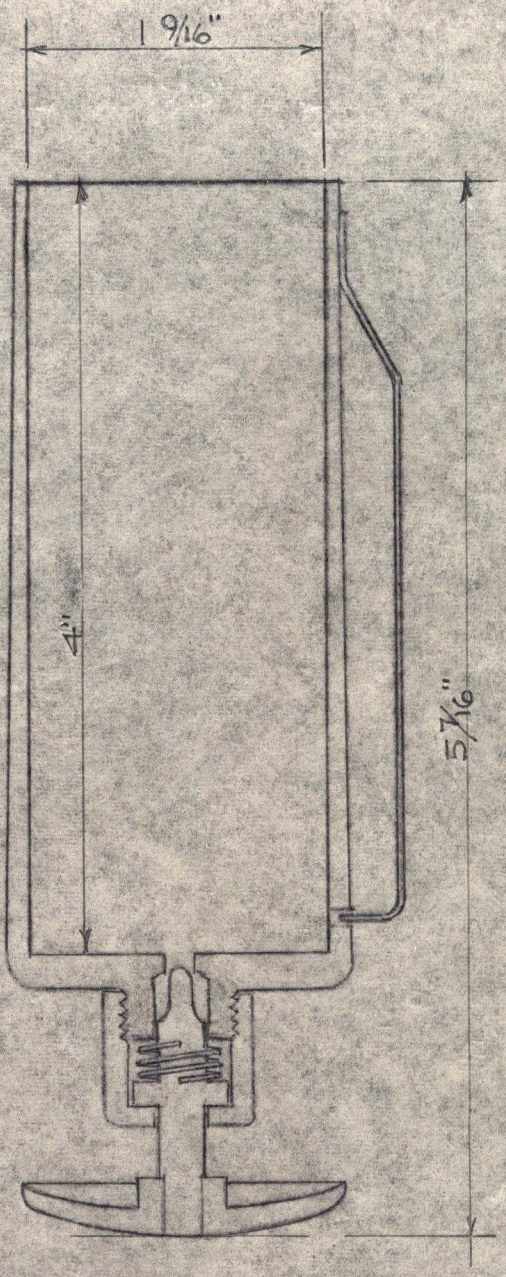

Figure 2
Recommended Projector

1. Made of steel
2. Weight: .88 lb.
3. Drawing: Full Scale

APPENDIX "B"

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Date: June 2, 1942.
Wind: 10-20 Miles per hour.

The following data was obtained by employment of a Battery Commander's Telescope M-1915.

A and N Signal	Type of Projector	No. Fired	Average Height
M-29	M-2	2	186 ft.
M-30	M-2	2	213 ft.
M-32	M-2	1	207 ft.
M-33	M-2	2	168 ft.
M-34	M-2	4	230 ft.
M-36	M-2	2	220 ft.
	No. of Signals Fired:	13	208 ft. Average height
M-29	IB	1	163 ft.
M-30	IB	2	185 ft. (1 was fired at approximately 75° angle).
M-32	IB	1	219 ft.
M-33	IB	3	221 ft.
M-34	IB	4	261 ft.
M-36	IB	2	236 ft.
	No. of Signals Fired:	13	225.5 ft. Average height

The powder charges in the Army and Navy signals are very inconsistant.

APPENDIX "C"

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MILITARY CHARACTERISTICS
for
Pyrotechnic Signals to be discharged from the Grenade Launcher, M1.

USE : Pyrotechnic signals to replace those used with the M4 projector (M17 to M22 inclusive).

TYPES AND COLORS OF SIGNALS : Same as the M17 to M22 signals plus a red star parachute and a red star cluster. Double star signals without parachute should also be produced in order that they may be tested as a replacement for Army and Navy aircraft signals, especially for Air-Ground Mutual Recognition and Identification.

METHOD OF PROJECTION : Grenade Launcher, M1, and a Special Blank Cartridge, Caliber .30, M3. (Using the Caliber .30, M1903 Rifle).

HEIGHT OF PROJECTION : 700 to 800 feet is desired for all but the double star signals. The double star signals should be ignited at approximately 300 feet or at such a height that the signal will burn out just prior to reaching the ground.

WEIGHT : Minimum necessary. A sample produced locally weighed .78 pounds.

OVERALL LENGTH : Minimum necessary. A sample produced locally measured 9-1/2 inches.

PROJECTOR CARTRIDGE : Preferable to be the same blank cartridge as used with the M11 grenade. To be carried within the tail assembly of the signal.

REMARKS : M11 grenade tail assemblies were placed on several M5, M6 and M7 pyrotechnic signals. The primers and propellant charges had been removed from the signals prior to incorporating the tail. The special blank cartridge used as propellant started the powder train burning in the signal. Due to the short burning time of the train the signals were ignited at an elevation of approximately

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REMARKS (CONT'D) : 500 feet. However, the signals were still gaining elevation when they were ignited. Since the launcher for the grenades will eventually be issued to numerous infantry men, it is believed the necessity of carrying a special pyrotechnic projector may be overcome.

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Signal Projectors

a. Pistol, Pyrotechnic, M2.

b. Projector, Signal, Ground M4.

PLATE I

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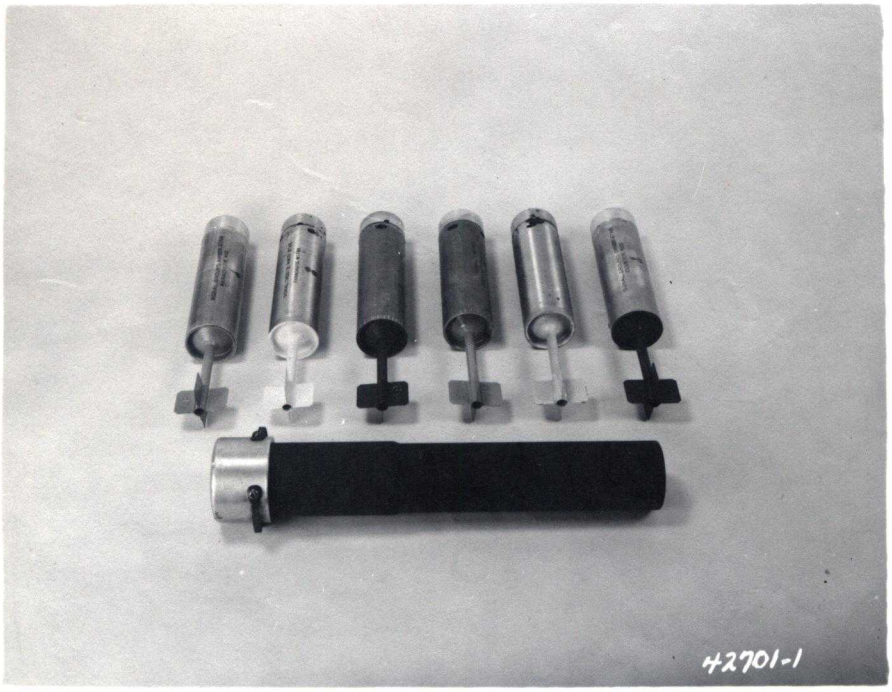

Signal Projectors

The Projector, Signal Ground, M4
with ground signals.

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Signal Projectors

The Pistol, Pyrotechnic, M2
with Army and Navy Type
Signals.

PLATE III

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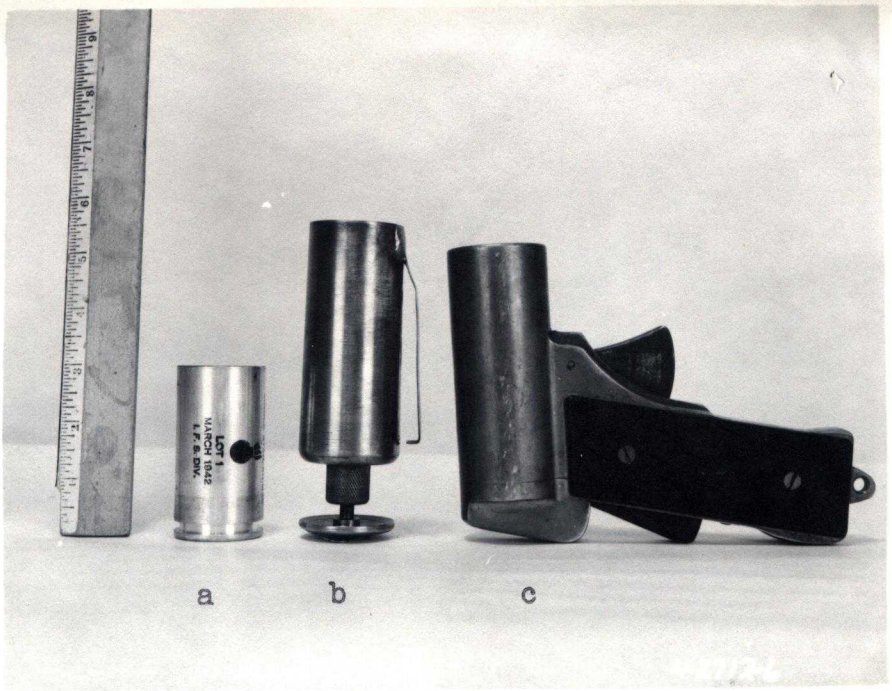

Comparative view of the Test Section projector and the Pistol Pyrotechnic, M2.

a - Army and Navy Pyrotechnic Signal.

b - Test Section Projector - Weight .88 lbs.

c - Pistol Pyrotechnic, M2 - Weight 3.23 lbs.

PLATE IV.

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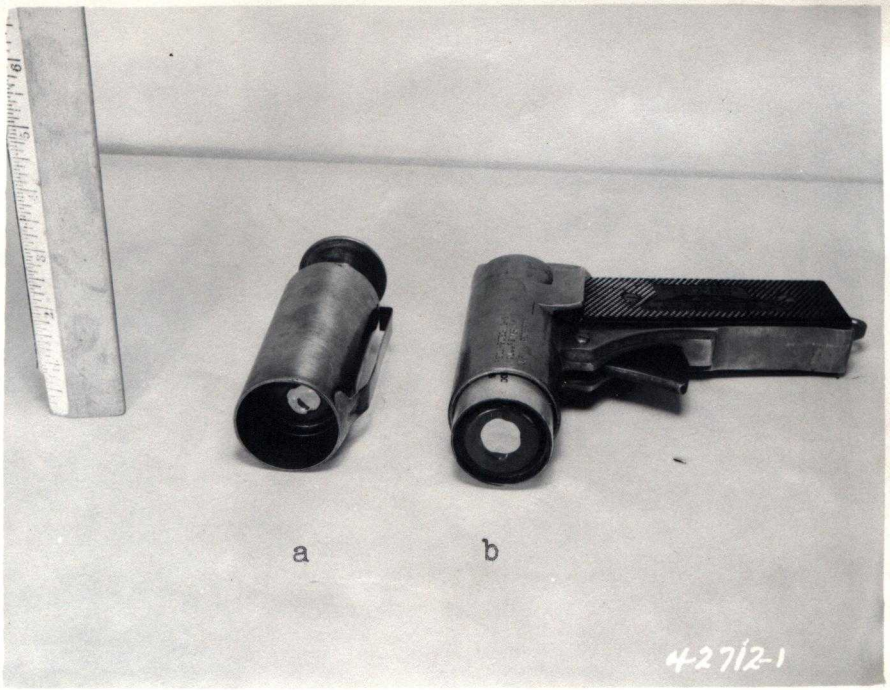

Army and Navy Pyrotechnic Signals in;

a - Test Section Projector,

b - Pistol Pyrotechnic, M2.

PLATE V

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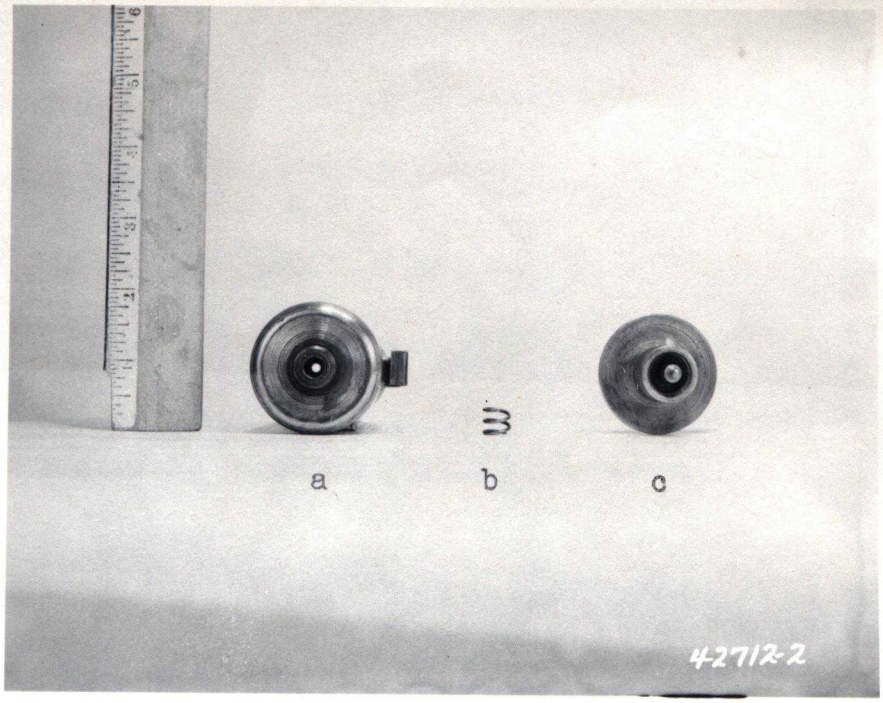

Details of Construction:

a - End view, firing pin end, Test Section Projector,

b - Firing pin spring,

c - Firing pin assembly.

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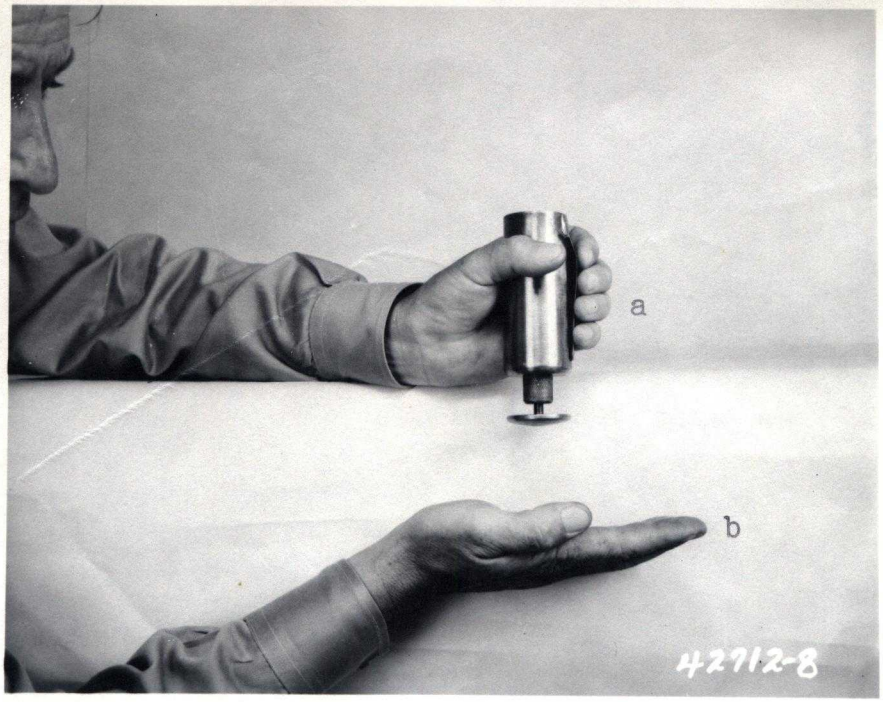

Firing position - Test Section Projector.

a - Projector is held firmly in one hand with finger tips depressing the cartridge retaining spring.

b - Other hand, palm up, is moved upwards so as to strike the beveled protruding end of the firing pin.

Recoil is not noticeable.

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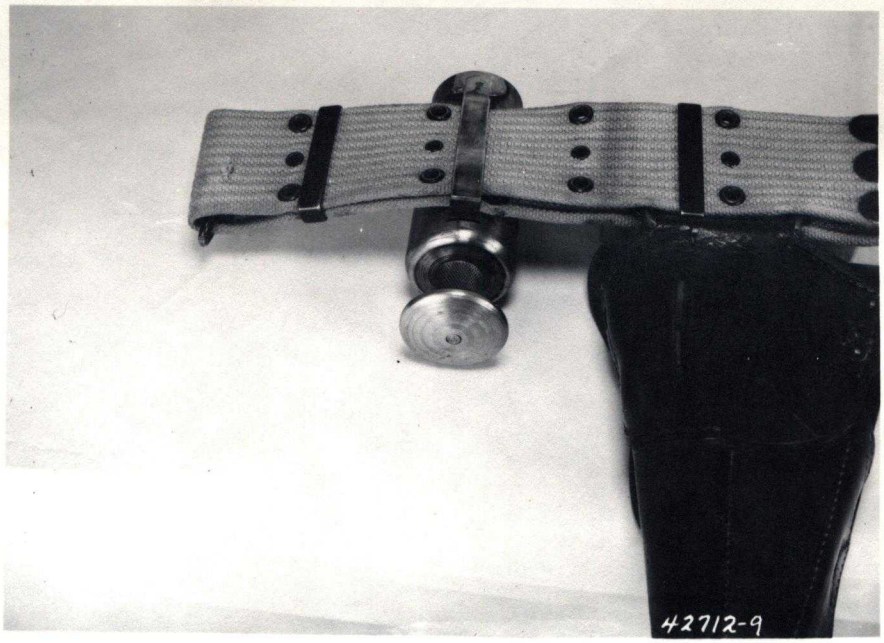

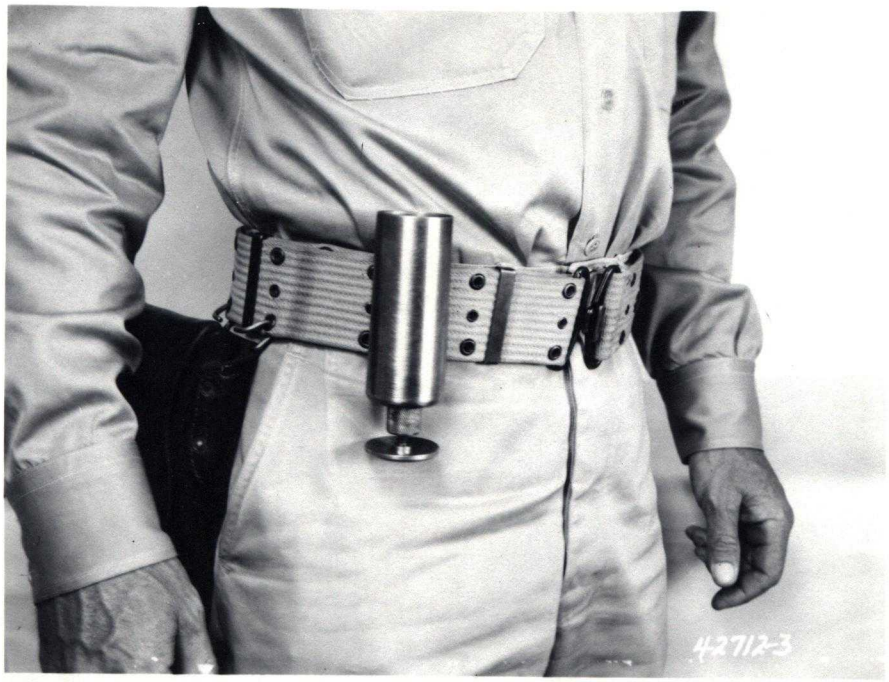

Test Section Projector fastened to pistol belt.

PLATE VIII

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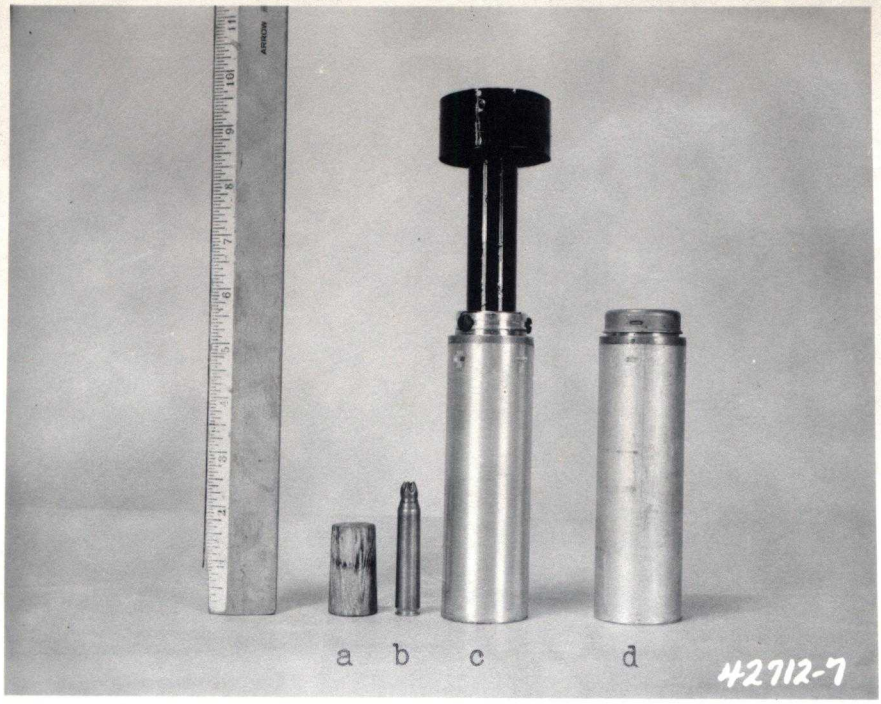

View of modified and unmodified M7 Pyrotechnic Signals.

a - Stopper,

b - Cartridge Cal. .30 blank M3,

c - M7 Pyrotechnic Signal with fin assembly from M11 grenade attached, Weight .81 lbs. complete with cartridge and stopper,

d - M7 Pyrotechnic Signal not modified, Weight .60 lbs.

PLATE IX

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a b

View of;

a - Launcher Grenade M1 - Weight .5 lbs.

b - M4 Projector - Weight 3.12 lbs.

PLATE X

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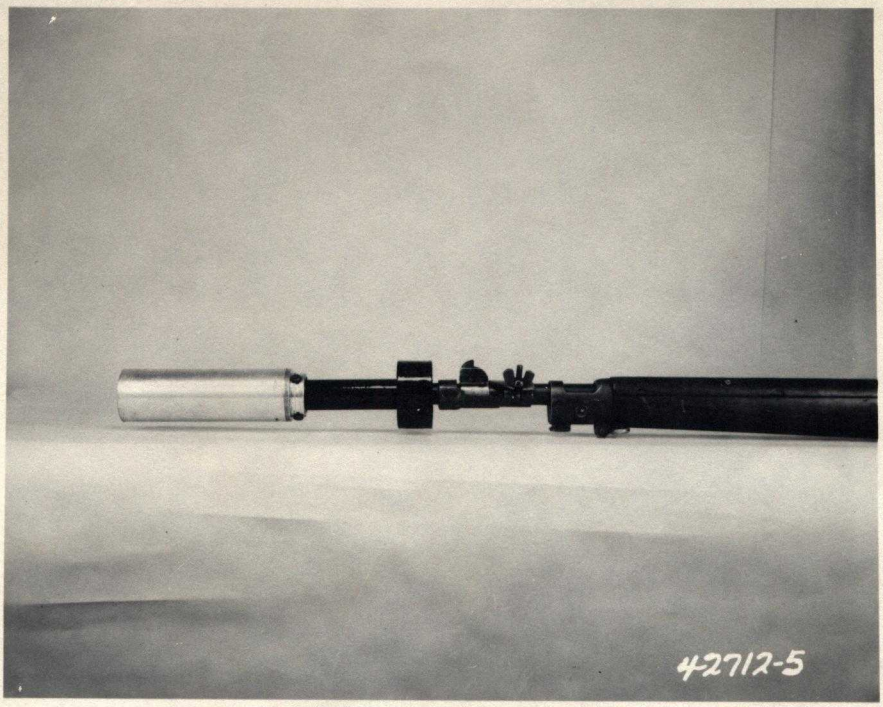

Modified M7 signal in firing position, on Launcher Grenade, M1 attached to M1903 Rifle.